10 May 1971

George:

Many thanks for the draft version of your paper "A Pilot Course in Engineering Systems Analysis". Herewith are some off-the-cuff comments.

I have taken the liberty of reading the paper from several perspectives - psychologist, bureaucrat, student drop-out, harried COTR, generalist and casual observer - and my comments will therefore reflect this diversified, perhaps disjointed, background. Please bear with me, for despite the tendency to come to a focus on minutiae, the spirit of the critique is quite positive in intent.

Right up front, I admit to having enjoyed the paper, and in general, agreeing with its philosophy. Your presentation is well-organized and comprehensive, but at times difficult to comprehend the first time through. Not wishing to belabor the obvious, I bring to your attention that the paper is abounding with the "buzz words" of the systems approach. While such semantics and stylistic idiosyncracies may lift the "system types" to euphoria, it drives the uninitiated to the dictionary. If your audience will be composed exclusively of folk sympathico with the systems engineering theme, you're probably on firm ground. If not, I question whether the average scientist possesses the intellectual fortitude to grasp the message.

In the subsection entitled "Problem Solving and Human Factors", you discuss a paper by Allen and Marquis (p. 4). Blissfully ignorant of the specifics of the referenced work, I nonetheless refuse to squelch the temptation to question the logic of the findings as stated. Your treatment implies that the mere introduction of an alternative solution in the face of prior failure leads to a probability of success proportional to the number of alternatives present (in this case, two). I feel certain that you don't really mean to say this, but as I interpret what is presented, that's the message. For the record, such a state of affairs does not follow if the probability of success associated with the alternative solution is equal to that of the original solution. In short, two wrongs won't carry the day.

As for the course itself, I do indeed regret that I was unable to follow through as planned. A number of reasons come to mind, and I shall address several of them in turn, since they may have applicability in your plans for future courses along these lines.

Whereas the 5% time committment for the course sounds eminently reasonable on the surface, there are practical obstacles associated with our activities at this end which preclude long-term, part-time participation in such a training program. For example, we here do a fair amount of traveling, and the scheduling of such travel is often at the pleasure of contractors and consultants. Then again, there's often the need to respond quickly to unexpected perturbations of the system.

Furthermore, there are those of us who live in the "suburbs of science", as it were, who only occasionally, often inadvertently, wander into the laboratory, more often than not to the consternation of the scientists and engineers ensconced therein. Our needs could be best satisified by an exposure, in a general fashion, to the essence of the systems approach sans the detail necessary to function as a systems engineer. In short, I make a plea for a week-long, concentrated, away-from-the-phones "systems appreciation" course emphasizing managerial examples at the expense of double integrals.

And speaking of integrals and such, this paper would not be complete if I failed to mention how favorably impressed I was with the caliber of the faculty and support personnel involved in the course. Those who by dint of relevant background and Agency responsibility were able to complete the course were offered a well-planned and executed program. But, of course, that's the way it was programmed, wasn't it.

My best wishes for continued success, and thanks again for the opportunity to review the paper. If I can be of any assistance in future activities, please feel free to call upon me.

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| 12 | Transforms, Hilbert, Fresnel, common kernel integrals . Problem Groups: spectrum shading, multipath transmissions, media | 3 |
| 7 | Servo System Analysis, flow analysis, sensitivity, feedback, transfer function, impulse response, error representation, statistical approach, smoothing and filtering, prediction compensation input/output relations. Problem Groups: signal input/output consideration, collection analysis techniques control systems, guidance devices | 8 |
| 10 | Fields and Wave Phenomena, array configuration, gain, spacing, shading, phase, signal/noise matrices, near fields, far fields Problem Groups: arrays for sensors, sidelobe exploitation, notching, spatial filtering, ranging, localization, holography, lens design, matched filters | 4 |
| 10 | Detection/Optimization, detection theory, tests criteria, minimax, likelihood ratio, false alarms/dismissals, Wiener-Hopf filters, optimum recovery, sequential. Problem Groups: detection devices, operator aids | 1 |
| 8 | Bayesian Statistics, error probabilities, average cost minimizing, thresholding, complex nets Problem Groups: PR devices, ATR state definition, event indicators, system design | 1 |
| 7 | Modulation, am, fm, ppm, pam, pcm, digital, noise immunity, common error codes, redundancy, error rate estimates, polynomials error codes, fading channels. Problem Groups: telemetry, coding, data transmission, security | 8 |

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TO
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SUBJ. (letter ) in Ref: to Comments about [illegible]
"A Pilot Course in Engineering Systems Analysis"
Orig. copy of memo Rec'd

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